

The State of the Hepatobiliary System in Children with Obesity and Metabolic Syndrome

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Received: 2024, 15, May

Accepted: 2025, 21, Jun

Published: 2025, 12, Jul

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Annotation: Obesity is one of the most important medical and social problems of modern society and is defined as a chronic progressive metabolic disorder with excessive accumulation of adipose tissue and relapses after cessation of treatment. Obesity in children, as a rule, persists into adulthood, leading to severe, life-threatening conditions. First of all, this is type 2 diabetes mellitus and diseases of the cardiovascular system and hepatobiliary system, leading to liver cirrhosis, early disability and premature death.

Keywords: childhood, obesity, metabolic syndrome, hepatobiliary system.

Enter. According to the World Health Organization, by the end of the 20th century, 30% of the world's population, or 1.7 billion people, will be overweight [2,6,8,9,10]. Over the past decade, obesity has been increasing uncontrollably worldwide. According to WHO experts, half of all children and adolescents are at risk of developing obesity [5,1,13,14]. Obesity is increasing at an alarming rate among children and adolescents worldwide. Today, one in four adolescents is overweight, and 15% of them are obese [4,11]. To date, it has been established that metabolic syndrome and changes in metabolism itself, observed in obesity, lead not only to cardiovascular diseases and type 2 diabetes, but also to the development of joint pain, infertility, fatty liver, hyperuricemia, malignant tumors, diseases leading to hypoxia (sleep apnea, asthma) and other diseases [3,7,12]. The origin of these diseases goes back to childhood.

The purpose of this study is to study the impact of obesity and metabolic syndrome on the hepatobiliary system of children.

Materials and methods of study

According to the results of epidemiological studies, 14% of adolescents aged 11-18 years were found to have high body mass, of which 2.5% were obese, with every third adolescent showing signs of metabolic syndrome. In adults, each component of the metabolic syndrome leads to secondary liver damage in the form of non-alcoholic fatty liver disease (NAFLD). It was found

that if the average prevalence of NAFLD is 23% (range 3 to 58%), then among people with high body mass, this figure is 74–100%. At the same time, non-alcoholic steatohepatitis was detected in 20–47% of those examined. There is also information that non-alcoholic steatohepatitis is detected at the age of 10–20 years. In the European Union, non-alcoholic steatohepatitis was observed in 2.6% of children, and among children with high body mass, this figure was 22.5–52.8%. In recent years, biliary tract pathologies have been observed in 41.9–62.4% of children with metabolic syndrome.

Results of the study and their analysis

The morphofunctional characteristics of the hepatobiliary system in obesity among children and adolescents have not been studied to date. Therefore, we studied the state of the liver and biliary tract in children with obesity and concomitant metabolic syndrome. We examined 78 children aged 11-18 years, of which 58 (31 boys and 27 girls) were obese. The duration of the disease in most patients (46%) was more than 4 years, in 35% - 2-3 years, and in 19% - less than 2 years. The age of onset of the disease was: 12-17 years - 47%, 11 years - 45%, 17-18 years - 8%. Exogenous-constitutional syndrome was observed in 45% of patients, hypothalamic in 50%, of which in half of the cases it developed against the background of primary obesity. In 5%, obesity was observed against the background of genetic syndromes. Cerebral obesity developed after a head injury in 1 child. Obesity of I–II degree was observed in 54% of patients, obesity of III–IV degree in 48%. In most cases (73%) adipose tissue was found to be of abdominal and mixed type, in rare cases (27%) of gynoid type. According to the results of the conducted clinical, laboratory and instrumental examinations, signs of metabolic syndrome were observed in half of the obese patients (51%). In most of the examined patients, pathology of the hepatobiliary system was detected. Non-alcoholic fatty liver disease was detected in 66.6% of children: on ultrasound, they observed increased exogenous and diffuse unevenness of the liver parenchyma, unclear vascular image, and refraction of ultrasound light. In 37.9% of children, an increase in alanine aminotransferase (ALT), 16% - an increase in aspartate aminotransferase (AST) by 1.5 times or more was detected, which indicates the development of non-alcoholic steatohepatitis. It was found that fatty liver disease occurs mainly in adolescents: over 14 years old - 49%, from 11 to 13 years old - 40%. Structural changes in the gallbladder wall were detected in 27 (47.2%) patients ($r < 0.05$). Cholestasis of the gallbladder was detected in 3 patients (5.5%). In 17 (33.3%) patients, changes in the lithogenic effect of bile, various stages of gallstone formation were observed. Gallstone disease was detected in 6 patients (11%). Biliary sediment was detected in 48 patients (83.3%) ($r < 0.05$). Another 18% of patients had a cloudy sediment in the gallbladder cavity. A positive correlation was found between fatty hepatosis of the liver, the duration of the disease ($\kappa=0.18$; $r < 0.05$). and the presence of metabolic syndrome ($\kappa=0.37$ at $r < 0.05$). It turned out that the waist circumference in children with biliary calculi was 109.7 ± 6.3 cm on average, which was significantly higher than in children with gallstone disease (93.5 ± 4.1 cm) ($r < 0.05$) and in children with unchanged bile colloid content (100.6 ± 9.1 cm) ($p < 0.05$), which indicates that children with abdominal obesity are more prone to developing gallstone disease.

In addition, in obese patients with liver and biliary tract pathology, specific differences were observed in the blood serum of patients with similar obesity but without changes in the hepatobiliary system. Thus, in patients with non-alcoholic fatty liver disease, an increase in ALT (45.1 ± 10.8 and 23.01 ± 11.1 IU/L), uric acid (432.1 ± 82.3 and 359.1 ± 84.5 $\mu\text{mol/L}$), fibrinogen (4.3 ± 0.72 and 3.47 ± 0.55 g/L), insulin (163.4 ± 103.18 and 114.1 ± 80.7 pmol/L) and insulin resistance NOMA index (5.28 ± 3.74 and 3.39 ± 1.98 , all differences were statistically significant $r < 0.05$) were observed. It was found that insulin and NOMA index were higher in patients with gallbladder wall pathology. The insulin level in them was 188.4 ± 78.2 pmol/l, while in children with unchanged gallbladders it was 161 ± 44.3 pmol/l ($r < 0.05$).

Conclusion

Specific differences in the state of the hepatobiliary system were found in children with and without metabolic syndrome. Signs of fatty liver dystrophy were more often observed in children with metabolic syndrome: 70%, in children without metabolic syndrome - 35% ($p < 0.05$). In children: various anomalies (bends, constrictions) were observed in 45% of children with metabolic syndrome and 25% of children without metabolic syndrome, changes in the gallbladder wall - 46 and 35%. Hyperexogenous deposition in the gallbladder (21 and 14%; ($r < 0.05$) was detected in children with metabolic syndrome, which is associated with changes in the physicochemical composition of bile and the motor function of the bile ducts. The data obtained indicate a close relationship between the pathology of the hepatobiliary system in children and disorders of carbohydrate and lipid metabolism, which requires timely implementation of complex therapeutic measures aimed at improving the morphofunctional state of the liver and bile ducts in obese children.

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